

What Is Claimed Is:

1. A method to form a contact comprising:
forming an insulating layer on a substrate;
etching the insulating layer to form a contact hole;
depositing a silicon layer on sidewalls and an undersurface of the contact hole;
forming a silicon spacer on the sidewalls of the contact hole by etching the silicon layer;
plasma treating the silicon spacer to form a silicon nitride spacer;
depositing a diffusion barrier on the silicon nitride spacer; and
filling the contact hole with tungsten.
2. A method as defined in claim 1, wherein depositing the silicon layer on the sidewalls and the undersurface of the contact hole comprises depositing the silicon layer on the sidewalls and the undersurface of the contact hole in a furnace at a temperature of approximately 500~700°C and a pressure of approximately 0.1~1 Torr
3. A method as defined in claim 2, wherein depositing the silicon layer on the sidewalls and then undersurface of the contact hole further comprises injecting approximately 1~5 standard liters per minute of SiH₄ gas into the furnace.

4. A method as defined in claim 1, wherein forming the silicon spacer on the sidewalls of the contact hole by etching the silicon layer further comprises anisotropic etching the silicon layer in a chamber of Cl_2 and HBr gases atmosphere.

5. A method as defined in claim 1, wherein forming the silicon spacer on the sidewalls of the contact hole by etching the silicon layer further comprises injecting approximately 10~50 sccm of Cl_2 and approximately 100~300 sccm of HBr into a chamber.

6. A method as defined in claim 5 wherein the pressure in the chamber is approximately 1~50 mTorr.

7. A method as defined in claim 1, wherein plasma treating the silicon spacer to form the silicon nitride spacer comprises NH_3 plasma treating the silicon spacer by increasing a density of the NH_3 plasma in a chamber.

8. A method as defined in claim 1, wherein plasma treating the silicon spacer to form the silicon nitride spacer comprises and NH_3 plasma treatment which adopts an inductive coupled plasma scheme.

9. A method as defined in claim 1, wherein plasma treating the silicon spacer to form the silicon nitride spacer comprises plasma treating the silicon spacer at a pressure of approximately 1~100 mTorr and injecting an

NH₃ gas atmosphere into a chamber at approximately 10~100 sccm,.

10. A method as defined in claim 1, wherein the diffusion barrier prevents tungsten from being diffused.

11. A method to form a contact comprising :
forming an insulating layer on a substrate;
etching the insulating layer to form a contact hole;
depositing a silicon layer on sidewalls and an undersurface of the contact hole;
forming a silicon spacer on the sidewalls of the contact hole by etching the silicon layer;
annealing the silicon spacer through a N₂ or NH₃ gas atmosphere heat treatment to form a silicon nitride spacer;
depositing a diffusion barrier on the silicon nitride spacer; and
filling the contact hole with tungsten.

12. A method as defined in claim 11, wherein depositing the silicon layer on the sidewalls and the undersurface of the contact hole comprises depositing the silicon layer in a furnace at a temperature of approximately 500~700°C and a pressure of approximately 0.1~1 Torr.

13. A method as defined in claim 12 wherein depositing the silicon layer comprises injecting SiH_4 gas into the furnace at approximately 1~5 slm.

14. A method as defined in claim 11, wherein etching the silicon layer comprises anisotropic etching the silicon layer in a chamber of Cl_2 and HBr gases atmosphere.

15. A method as defined in claim 14, wherein the Cl_2 is injected into the chamber at approximately 10~50 sccm and the HBr is injected into the chamber at approximately 100~300 sccm, and wherein a pressure of the chamber is approximately 1~50 mTorr.

16. A method as defined in claim 11, wherein the N_2 or NH_3 gas is injected into the chamber at approximately 5~20 slm and wherein the temperature in the chamber is approximately 600~800°C.

17. A method as defined in claim 11, wherein the diffusion barrier prevents tungsten from being diffused.

18. A semiconductor device comprising:
a substrate;
an insulating layer on the substrate;
a contact hole in the insulating layer;
a silicon nitride spacer on sidewalls and an undersurface of the contact

hole;

a diffusion barrier on the silicon nitride spacer; and

a conductive metal in the contact hole.